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258. Proposed by REV. R. D. CARMICHAEL, Hartselle, Ala.

Sum the infinite series $\frac{n^2}{(4n^2-1)^2}$ beginning with $n=1$, n being always odd.

Solution by G. B. M. ZERE, A. M., Ph. D., Parsons, W. Va.

$$\frac{n^2}{(4n^2-1)^2} = \frac{1}{16} \left[\frac{1}{(2n-1)^2} + \frac{1}{(2n+1)^2} - \frac{1}{2n+1} + \frac{1}{2n-1} \right]$$

Let $u=1, 3, 5, 7, \dots$ Then

$$\sum \frac{n^2}{(4n^2-1)^2} = \frac{1}{16} \left[\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \frac{1}{9^2} + \dots \right] + \frac{1}{16} \left[\frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots \right].$$

$$\therefore \sum \frac{n^2}{(4n^2-1)^2} = \frac{1}{16} \cdot \frac{\pi^2}{8} + \frac{1}{16} \cdot \frac{\pi}{4} = \frac{\pi}{64} [\frac{1}{2}\pi + 1] \quad (\text{See line 1, p. 41}).$$

Also solved by G. W. Greenwood, and Henry Heaton.

CALCULUS.

133. Proposed by NELSON L. RORAY, South Jersey Institute, Bridgeton, N. J.

Evaluate $\int \frac{\sqrt{1+y}}{1+y^2} dy$.

Solution by HENRY HEATON, Belfield, N. D.

$$\begin{aligned} \text{Let } 1+y=z^2; \text{ then } \int \frac{\sqrt{1+y}}{1+y^2} dy &= \int \frac{2z^2 dz}{z^4-2z^2+2} = \frac{1}{2a} \int \left(\frac{z}{z^2-2az+\sqrt{2}} \right. \\ &\quad \left. - \frac{z}{z^2+2az+\sqrt{2}} \right) dz, \text{ where } a = \sqrt{\frac{\sqrt{2}+1}{2}}. \\ \frac{1}{2a} \int \left(\frac{z}{z^2-2az+\sqrt{2}} - \frac{z}{z^2+2az+\sqrt{2}} \right) dz &= \frac{1}{2a} \int \left(\frac{(z-a)+a}{z^2-2az+\sqrt{2}} \right. \\ &\quad \left. - \frac{(z+a)-a}{z^2+2az+\sqrt{2}} \right) dz = \frac{1}{2a} \log \sqrt{\frac{z^2-2az+\sqrt{2}}{z^2+2az+\sqrt{2}}} + \frac{1}{2\sqrt{1/2-a^2}} \left(\tan^{-1} \frac{z-a}{\sqrt{1/2-a^2}} \right. \\ &\quad \left. + \tan^{-1} \frac{z+a}{\sqrt{1/2-a^2}} \right) = \sqrt{\frac{\sqrt{2}-1}{2}} \log \sqrt{\frac{1+y-\sqrt{[2\sqrt{2}+2]}\sqrt{[1+y]}+\sqrt{2}}{1+y+\sqrt{[2\sqrt{2}+2]}\sqrt{[1+y]}+\sqrt{2}}} \\ &\quad + \sqrt{\frac{\sqrt{2}+1}{2}} \tan^{-1} \left(\frac{\sqrt{[2\sqrt{2}-2]}\sqrt{[1+y]}}{\sqrt{2-1-y}} \right). \end{aligned}$$